

Transportation  
Safety and  
Mobility

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**Project Title:**

High Occupancy Vehicle (HOV)  
System Analysis Tools—District 8 HOV  
Facility Performance Analysis

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## Evaluating the Operational Performance of District 8 HOV Lanes

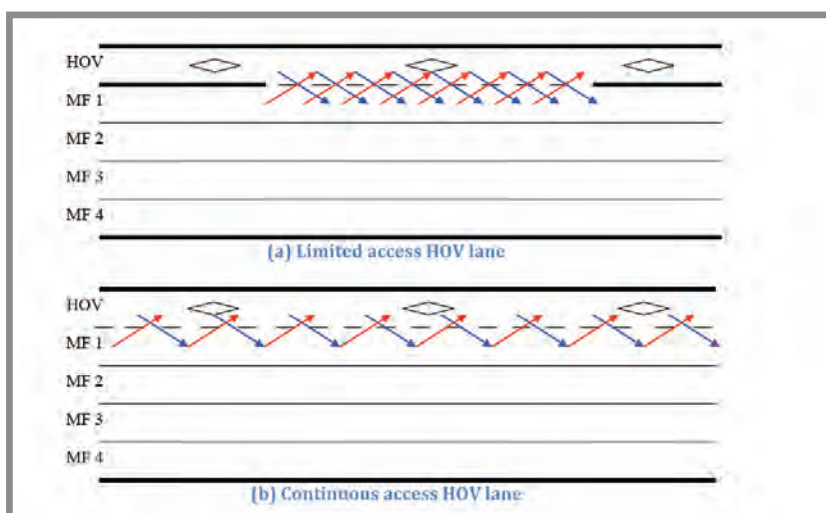
*Comparing limited-access and continuous-access HOV lanes to improve traffic flow*

### WHAT WAS THE NEED?

High occupancy vehicle (HOV) lanes are an integral part of the California highway system, so it is important to ensure that they are meeting their purpose of improving mobility, trip time reliability, and air quality. California has two basic types of HOV lanes—limited access and continuous access. This research addressed mobility by comparing which HOV access type is better for overall freeway performance, focusing on the HOV facilities in Caltrans District 8.

### WHAT WAS OUR GOAL?

The goal was to develop methodologies to assess the operational performance of HOV facilities and determine the pros and cons of limited-access versus continuous-access lanes.



Continuous-access and limited-access HOV lanes

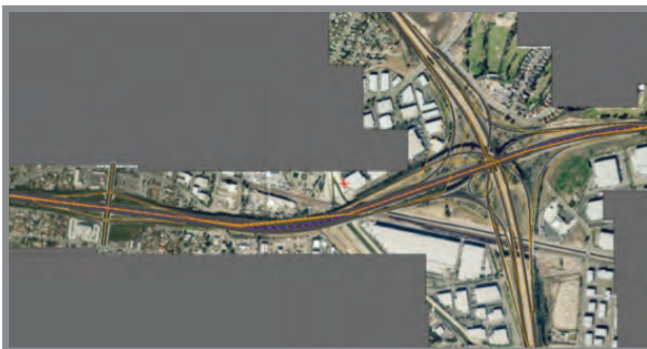
## WHAT DID WE DO?

To compare the operational performance of limited-access and continuous-access HOV facilities in District 8, Caltrans, in partnership with the University of California, Riverside Center for Environmental Research and Technology, used five different research methodologies to gain a comprehensive view:

- Corridor-level analysis using field data from the Performance Measurement System (PeMS) and District 8's 2008 HOV Monitoring Report Statistics
- Regression analysis to estimate the impact of the lane access type on freeway throughput based on data of statewide HOV facilities
- Video collected in the field to examine the lane-changing behavior of each access type
- Simulation tool to compare performance under different congestion levels
- Before-and-after study of SR-60 in Moreno Valley, where the HOV facilities were converted from full-time limited access to part-time continuous access



Lane change data extracted from video footage using a software tool developed in this research



Portion of the simulated freeway network of SR-91 and I-15 in Riverside County

## WHAT WAS THE OUTCOME?

The data collected indicated that the District 8 HOV facilities operated at a good level of service. All facilities, except for those on SR-91, maintained a travel speed of greater than 45 mph during peak hours for at least 75% of the time. The SR-91 facilities experienced delays partly due to bottlenecks around the ingress and egress areas. The regression models consistently showed that the HOV lane access type would have a significant effect on the maximum throughput of a freeway segment, and that a freeway with a limited-access HOV lane would accommodate higher maximum throughput than a continuous-access lane, if all other geometric characteristics are the same.

For limited access, most lane changes occurred within the first half of the ingress or egress area. Lane changes between the continuous-access HOV lane and the adjacent lane were smoother than the limited access because motorists had a larger time gap. When simulating the freeway network, both access types had similar average travel speeds when uncongested (greater than 50 mph). When mildly congested (travel speed of 35–50 mph), the continuous-access lanes had higher average travel speeds.

After SR-60 was converted to part-time continuous access, the eastbound direction carried more vehicle miles and had higher travel speeds. The HOV violation rates increased, while the number of collisions decreased.

## WHAT IS THE BENEFIT?

California has an extensive network of HOV facilities, which will continue to grow in the coming years. HOV access plays an important role in maintaining traffic flow. Based on the findings, both limited-access and continuous-access HOV lanes have advantages. The limited-access lanes have buffered sections that separate the traffic flow from the adjacent lane, resulting in higher freeway throughput. Continuous-access lanes spread out lane changing, reducing major traffic disturbances that can cause delays. HOV facilities could improve traffic by combining these advantages, such as use continuous access for most of the corridor to achieve higher average travel speed, but strategically place buffers at critical freeway segments—for example, around non-HOV-related bottlenecks and ramp merges—to facilitate higher throughput on those segments.

## LEARN MORE

To view the complete report:  
[www.dot.ca.gov/research/researchreports/reports/2012/final\\_report\\_task\\_1205.pdf](http://www.dot.ca.gov/research/researchreports/reports/2012/final_report_task_1205.pdf)